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मानक

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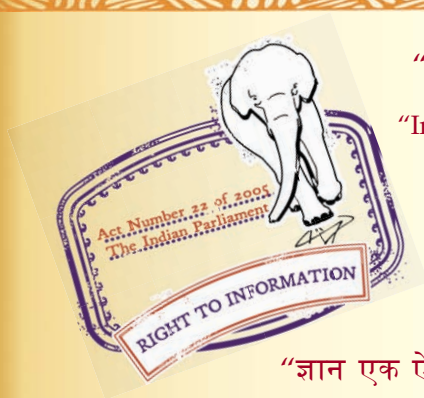
“The Right to Information, The Right to Live”

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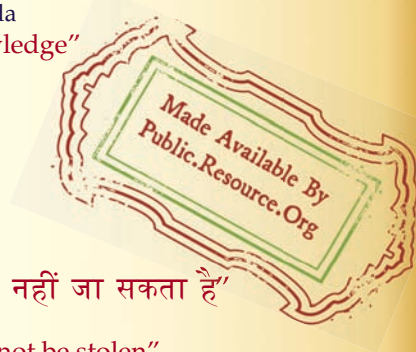
IS 6125 (1971): Enamel, synthetic, stoving, for automobiles
[CHD 20: Paints, Varnishes and Related Products]



“ज्ञान से एक नये भारत का निर्माण”

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“Invent a New India Using Knowledge”



“ज्ञान एक ऐसा खजाना है जो कभी चुराया नहीं जा सकता है”

Bhartrhari—Nitiśatakam

“Knowledge is such a treasure which cannot be stolen”

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IS : 6125 -1971

Indian Standard
SPECIFICATION FOR
ENAMEL, SYNTHETIC, STOVING,
FOR AUTOMOBILES

(Second Reprint OCTOBER 1990)

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

AMENDMENT NO. 1 JULY 1988
TO
IS : 6125 - 1971 SPECIFICATION FOR ENAMEL,
SYNTHETIC, STOVING, FOR AUTOMOBILES

(*Page 4, clause 3.6*) — Delete.

[*Page 5, Table 1, Sl No. (xix)*] — Add the following new requirement after Sl No. (xix):

(1)	(2)	(3)	(4)
xx)	Wet opacity	Between — 10 percent and + 20 percent of the approved sample	10

(CDC 8)

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Indian Standard

SPECIFICATION FOR ENAMEL, SYNTHETIC, STOVING, FOR AUTOMOBILES

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(Continued on page 2)

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IS : 6125 - 1971

(Continued from page 1)

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Indian Standard
SPECIFICATION FOR
ENAMEL, SYNTHETIC, STOVING,
FOR AUTOMOBILES

0. FOREWORD

0.1 This Indian Standard was adopted by the Indian Standards Institution on 9 June 1971, after the draft finalized by the Paints and Allied Products Sectional Committee had been approved by the Chemical Division Council.

0.2 The material is intended to be used for finishing of automobiles to give high gloss finish. The finishing shall be compatible with the primer-surfacer and shall be able to produce a satisfactory levelling and flow characteristics together with minimum of film shrinkage after stoving. The material is also expected not to exhibit excessive solvent attack on primer-surfacer as to detract or mar the final appearance.

0.3 The ancillaries like the primer-surfacer, thinners, etc, shall be obtained from the same manufacturer to ensure good results. For purposes of test, these should be from the same source.

0.4 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960*. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

1. SCOPE

1.1 This standard prescribes the requirements and methods of sampling and test for enamel, synthetic, stoving, for automobiles. The material is intended for protection and decoration of metal and steel parts of automobiles and other vehicle bodies like autocycles and scooters.

2. TERMINOLOGY

2.1 For the purpose of this standard, the definitions given in IS : 1303-1963† and under 2 of IS : 101-1964‡ shall apply.

*Rules for rounding off numerical values (*revised*).

†Glossary of terms relating to paints (*revised*).

‡Methods of test for ready mixed paints and enamels (*second revised*).

3. REQUIREMENTS

3.1 Composition — The material shall be based on synthetic resins, pigments and suitable solvents as to satisfy the requirements of this standard. The composition of the vehicle and pigment of the bulk supply shall be similar to those of the registered sample.

3.2 Toxicity — The material shall be free from toxic solvents like benzene and chlorinated organic solvents when tested as prescribed in Appendix A.

3.3 Durability

3.3.1 Registered Sample — Sample supplied in advance by a prospective supplier and registered by the approved testing authorities after testing it to all the requirements of this standard. A complete record of its performance shall be kept in respect of all tests.

3.3.2 When prepared and tested for normal outdoor exposure as prescribed under **B-3**, a general breakdown of the film prepared from the registered sample of the material shall not occur in less than 24 months.

3.3.3 A film of the sample for registration shall be prepared and tested in an accelerated weathering apparatus for a period of 30 days as prescribed under **B-4** and a complete record of its performance maintained.

NOTE — As precaution against inadvertent accidents, the outdoor exposure test (**B-3**) and the accelerated weathering test (**B-4**) shall be carried out in duplicate.

3.3.4 Sample from Bulk Supply — A film of the material prepared from a representative sample from bulk supply as described in Appendix B and tested in the accelerated weathering apparatus (**B-4**) shall not be materially different in performance as compared with the record of the film of the registered sample. The film shall be examined daily for the period of 30 days.

3.4 The material shall also comply with the requirements given in Table 1.

3.5 Retouchability with Cellulose Nitrate Lacquers — The material, when tested as prescribed in Appendix J, shall pass the test.

3.6 Optional Requirements — In addition, if agreed to between the purchaser and the supplier, the spreading capacity, spreading time and wet opacity shall be determined in accordance with the relevant methods of test as given in IS : 101-1964* and the results recorded on the sample offered for approval against the specification. In the case of supplies offered against any approved sample to this specification, these characteristics shall be within 90 percent of the approved sample.

4. PACKING AND MARKING

4.1 Packing — The material shall be packed in metal containers as agreed to between the purchaser and the supplier.

*Methods of test for ready mixed paints and enamels (*second revision*).

**TABLE 1 REQUIREMENTS FOR ENAMEL, SYNTHETIC, STOVING,
FOR AUTOMOBILES**
(Clause 3.4)

SL No.	CHARACTERISTIC	REQUIREMENT	METHOD OF TEST, REF TO	
			Appendix	Clause No. in IS: 101-1961*
(1)	(2)	(3)	(4)	(5)
i)	Drying time, hard dry	Not more than 30 minutes at 130°C	—	7.3.2
ii)	Consistency, Ford Cup No. 4, Sec	45 to 55, smooth and uniform and suitable for spraying after thinning	—	7.4
iii)	†Finish	Smooth and glossy	—	7.5
iv)	†Gloss:			
	a) Initial, <i>Min</i>	90 percent	—	7.7
	b) Retention	Loss not more than 10 percent of the original gloss	C	—
v)	†Colour	Close match to the specified colour	—	11
vi)	†Fastness to light (200 hours)	To pass test	—	12
vii)	†Scratch hardness (With 1500 g)	No such scratches as to show the bare metal		15.1
viii)	†Flexibility and Adhesion	No visible damage or detachment of film	—	16
ix)	†Stripping test	Scratches free from jagged edges	—	17
x)	†Protection against corrosion in a system (for 250 h)	No blistering, rusting or loss of adhesion (<i>see Note</i>)	—	18
xi)	Resistance to lubricating oil	To pass the test	—	19
xii)	Resistance to petrol	do	—	21
xiii)	Resistance to heat (double bake schedule consists of bake-cool-bake-cool)	do	—	22
xiv)	Resistance to bleeding	do	D	—
xv)	Resistance to water and soap spotting	do	E	—
xvi)	Tape test	No permanent stain of tape	F	—
xvii)	Impact resistance	To pass the test	G	—
xviii)	Intercoat adhesion	do	H	—
xix)	Keeping properties	Not less than 6 months	—	31

NOTE — Isolated minor blistering without corrosion shall not be the cause for rejection. These blisters should disappear when kept in an oven at 110°C for 10 minutes,

*Methods of test for ready mixed paints and enamels (*second revision*).

†These tests shall be carried out on stoved films after keeping them at room temperature for 24 hours.

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42 Marking— Each container shall be marked with the following:

- a) Name and colour of the material;
- b) Name of the manufacturer and trade-mark, if any;
- c) Volume of the material; and
- d) Month and year of manufacture.

4.3 Other details of marking shall be as agreed to between the purchaser and the supplier.

5. SAMPLING

5.1 Preparation of Test Samples

5.1.1 For Registration— The sample shall be submitted in three different containers each containing not less than 500 ml of the material.

5.1.1.1 As the testing to the requirements of this standard covers a period of more than 24 months, the supplier is advised to submit samples for registration sufficiently in advance.

5.1.2 Tender Sample— The supplier may dispense with sending a tender sample provided that he declares that the material for which the tender is given is of same quality as the sample previously registered in his name.

5.1.3 Bulk Supply Sample— Representative samples of the material shall be drawn as prescribed under **3** of IS : 101-1964*.

6. TEST METHODS

6.1 Tests shall be conducted as prescribed in IS : 101-1964* and in Appendices A to J. References to relevant clauses of IS : 101-1964* are given in col 5 of Table 1 and in **3.6**. References to Appendices are given in **3.2**, **3.3**, **3.5** and in col 4 of Table 1.

6.2 Quality of Reagents— Unless specified otherwise, pure chemicals and distilled water (*see* IS : 1070-1960†) shall be employed in tests.

NOTE —'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

APPENDIX A (Clause 3.2)

TEST FOR TOXICITY

A-0. GENERAL

A-0.1 Outline of Method— The material is steam distilled and solvents collected. It is subjected to test for benzene and chlorinated hydrocarbons qualitatively.

*Methods of test for ready mixed paints and enamels (*second revision*).

†Specification for water, distilled quality (*revision*).

A-1 APPARATUS**A-1.1 Steam Distillation Apparatus****A-1.2 Distilling Flask** — 100 ml capacity.**A-2. REAGENTS****A-2.1 Nitric Acid** — conforming to IS : 264-1968*.**A-2.2 Sulphuric Acid** — conforming to IS : 266-1961†.**A-2.3 Copper Wire** — of 1 mm diameter.**A-3. PROCEDURE**

A-3.1 Steam distill 100 ml of the material using a receiver cooled in ice. Separate the solvent layer, wash with several times its volume of distilled water, discard the washings dry and redistill, collecting all solvents within the agreed specified boiling range. Subject this to the tests prescribed in **A-3.1.1** and **A-3.1.2**.

A-3.1.1 Test for Benzene — Mix equal volumes of nitric acid and sulphuric acid in a test tube and cool. To 2 ml of this solution add 10 drops of the solvent and shake. Warm, if necessary and examine for the odour of nitrobenzene which is given by 5 percent benzene or larger amounts of toluene. Boil the contents for at least 30 seconds, allow to cool and add 10 ml of water. Mix the contents and examine for odour of nitrobenzene, which should be no longer present if the contents were boiled enough. Allow the tube to stand for some time. A yellow cloudy solution or flocculent precipitate changing to yellow needles is evidence of the presence of benzene. It may further be confirmed by separating the yellow needles and finding out its melting point which should be 89 to 90°C.

In case of dispute gas chromatography may be employed to detect the presence of benzene using analytical grade benzene as standard.

A-3.1.2 Test for Chlorinated Hydrocarbons — Form a small loop in the copper wire and heat in a small Bunsen flame until it no longer colours the flame. Allow the loop to cool and then dip it into the test solution. Immediately place in the outer part of the flame and when the first luminous flame disappears, examine for the green colouration due to chlorinated compounds.

A-3.2 The material shall be deemed to have passed the test if the solution, when tested as prescribed in **A-3.1.1**, does not give off smell of nitrobenzene or forms yellow crystals and when tested as prescribed in **A-3.1.2** does not impart a green colouration to the Bunsen flame.

*Specification for nitric acid (*revised*).

†Specification for sulphuric acid (*revised*).

APPENDIX B

(Clause 3.3)

DETERMINATION OF DURABILITY

B-0. GENERAL

B-0.1 Outline of Method — The durability of the material is determined by ascertaining actual behaviour of suitably prepared test panels in normal outdoor exposure test for a specified period and evaluating the results of this exposure by a suitable method of rating for various characteristics of the enamel film. Apart from this, the material is also evaluated by an accelerated weathering test wherein a prepared panel is subjected to controlled exposure of heat, light and water in an artificial weathering apparatus.

B-1. TEST PANELS

B-1.1 Test panel shall be of mild steel (5.2 of IS : 101 - 1964*) 300 × 300 × 1.6 mm in size and free from surface imperfections.

B-2. PREPARATION OF TEST PANELS

B-2.1 In the painting procedure outlined under **B-2.2**, the stoving shall be done at 130°C.

B-2.2 The complete painting system shall consist of the following steps:

- a) Remove all scale, dust, grease and foreign matter from the surface of the panel by suitable methods. Wherever necessary, the cleaned panel shall be rinsed in cold or hot water to remove such residues of cleaning materials as might affect the phosphating process. The phosphate treatment shall be of zinc-phosphate coating [see IS : 3618-1966†] and with a minimum coating weight of 4.3 g/m². After phosphate treatment, rinse the panel thoroughly to remove any residues of the phosphating solution first with water and then with a chromate solution at a temperature not below 60°C and having chromate (as CrO₃) concentration of 0.125 to 0.50 kg/1000 litres.

NOTE — The chromate rinse shall consist of a solution of chromic acid or alkali metal chromate or alkali metal dichromate or a mixture of equal parts of chromic and phosphoric acids.

After final rinsing, dry the panel thoroughly and use for painting without much delay.

- b) Apply two coats of primer surfacer [conforming to Indian standard specification for primer surfacer, stoving exterior, red

*Methods of test for ready mixed paints and enamels (*second revision*).

†Phosphate treatment of iron and steel for protection against corrosion.

and grey for automobiles (under preparation)] suitably thinned to spraying consistency using appropriate thinner wet-on-wet allowing a flash off time of 10 minutes between coats and bake for 30 minutes to give a total dry film thickness of 50.0 to 62.5 microns.

- c) Rub down wet with emery paper No. 280, followed by No. 400 until the surface is sufficiently smooth and even to take a coat of the material. About 50 microns thickness of the film shall be left after flattening. Wash the surface with water to remove all loosely adhered dust and dry for 30 minutes.
- d) Wipe with petrol damped rag. Apply two coats of the material thinned suitably to spraying consistency with appropriate thinner wet-on-wet with a flash of time of 10 minutes, between coats and bake for 30 minutes to give a total dry film thickness of this finish to be 32.5 to 50 microns.

B-3. NORMAL OUTDOOR EXPOSURE TEST

B-3.0 Subject the sample for registration to normal outdoor exposure test in the manner described under **B-3.1**.

B-3.1 Expose in the open the test panels, prepared in the manner prescribed under **B-1** and **B-2**, in duplicate, in a position facing south at 45°.

B-3.1.1 Examine the condition of the exposed films at monthly intervals for gloss retention, at the end of 24 months for corrosion of the substrate and at bi-monthly intervals for the other characteristics given below:

- a) Colour;
- b) Checking, cracking and blistering;
- c) Chalking; and
- d) Blooming and spotting.

B-3.1.2 For the above examination, wash the right hand half of the surface of the two test panels by pouring water and then wiping with a soft cloth or chamois leather (*see* IS : 1017 - 1962*). Adequate time for cooling of the panels to room temperature shall be allowed prior to washing. Polish half of the left half of the panel and assess gloss after polishing. Examine the same portions of the test panels at each examination. As an aid in the examination, a magnifying glass may be used, but the evaluation shall be based on an assessment with the unaided eye. At the end of the stipulated period for durability test, examine all the three portions of the test panels. The sample shall be considered satisfactory if the material surface underneath as well as condition of the film in all the parts, the one washed periodically, the one polished periodically and the one washed only for the final examination is satisfactory by the method of evaluation described hereunder (*see* **B-3.2**). Stray film failure due to extraneous causes other than climatic shall be ignored.

*Specification for chamois leather.

B-3.2 Method of Rating — The film of an unexposed test panel possessing high gloss shall be rated at 100, which figure shall be made up of basic values as follows:

a) Possessing high gloss after polishing	20
b) Possessing correct colour	20
c) Freedom from checking, cracking and blistering	20
d) Freedom from chalking	10
e) Freedom from blooming and spotting	10
f) Freedom from corrosion of metal substrate	20
	100

NOTE—The initial rating of film may be 100 or less according to the conditions of gloss and colour, the rating for freedom from checking, cracking, blistering, chalking, blooming and spotting being always maximum in the case of unexposed films.

B-3.3 Evaluation of Exposed Film — In recording the condition of the exposed films at each examination, express the observed relative values of different characteristics in percentages of the basis value allotted to each characteristic under **B-3.2**. For arriving at an assessment, multiply the basic value for each assessment (*see B-3.2*) by the percentage awarded for the performance in the test and divide the product so obtained by 100 to obtain the percentage award for the observed value of each characteristic. Take the sum of these resulting values as the overall assessment.

B-3.3.1 The following table is intended to serve as an example for the assessment of enamel film after exposure.

<i>Sl No.</i>	<i>Characteristic</i>	<i>Basic Value percent</i>	<i>Performance Value percent</i>	<i>Assessment Value percent</i>
(1)	(2)	(3)	(4)	(5)
i)	Possessing high gloss after polishing	20	80	16
ii)	Possessing correct colour	20	60	12
iii)	Freedom from checking, cracking and blistering	20	90	18
iv)	Freedom from chalking	10	40	4
v)	Freedom from blooming and spotting	10	80	8
vi)	Corrosion of the metal substrate	20	90	18
				76

B-3.4 Results of Exposure — Reckon the period for the general breakdown of the exposed film from the date of commencement of exposure to the time when the overall assessment falls below 70 percent or when the performance value of any one characteristic falls below 50 percent of the basic value adopted for that characteristic. In the example given under **B-3.3.1**, although the overall assessment is 76 percent, yet the film is to be regarded as generally having broken down, because the performance value of chalking has fallen below 50 percent of its basic value.

B-4. ACCELERATED WEATHERING TEST

B-4.1 Accelerated Weathering Apparatus — An artificial weathering apparatus of the carbon arc type for uniform and controlled exposure to the effects of heat, light and water.

B-4.2 Samples for registration shall be tested in duplicate for 200 hours in a suitable accelerated weathering apparatus (**B-4.1**) and samples drawn from bulk supplies shall be tested in a similar manner. The test panels shall be prepared as described under **B-2.2**. The requirements of this test shall be taken to have been satisfied if the performance of the film is not materially different as compared with the record of the film of the registered sample.

APPENDIX C

[Table 1, Sl No. (iv)(b)]

DETERMINATION OF GLOSS RETENTION

C-0. GENERAL

C-0.1 Outline of Method — The painted panels after specified period of ageing are examined for shrinkage and loss of gloss.

C-1. PROCEDURE

C-1.1 After 10 days of ageing at room temperature, the painted panels shall not exhibit film shrinkage and there shall not be loss of gloss more than 10 percent of the original gloss when determined as prescribed in 7.7 of IS : 101 - 1964*.

*Methods of test for ready mixed paints and enamels (*second revision*).

APPENDIX D

[Table 1, Sl No. (xiv)]

RESISTANCE TO BLEEDING

D-0. GENERAL

D-0.1 Outline of Method— The painted panel is coated with a white finishing enamel and examined for bleeding.

D-1.1 Prepare a $300 \times 100 \times 0.6$ mm steel panel so that all of the panel except for 25 mm lengthwise is primed. Tape off 40 mm lengthwise, which will include the unprimed section and enamel in the remainder of the panel. After the panel has been baked and then cooled to room temperature, the bottom half of the enamelled area is sanded with sandpaper No. 360 until the surface is completely free from gloss. Remove all of the sanding dust with a cloth dampened with petroleum hydrocarbon solvents. Remove the mask and spray the entire panel with white enamel synthetic, stoving, conforming to this standard. Bake for 30 minutes at a temperature of 130°C . Examine the panel for bleeding.

D-1.2 The material shall be deemed to have passed the test if there is no bleeding.

APPENDIX E

[Table 1, Sl No. (xv)]

DETERMINATION OF RESISTANCE TO SOAP WATER AND SPOTTING

E-1. PROCEDURE

E-1.1 Prepare the panel as prescribed in **B-2.2**. After 24 hours curing and 168 hours outdoor exposure facing south at 45° angle, place two cotton pads of 4 cm diameter, one soaked with water and other soaked with one percent soaps solution (conforming to IS : 285 - 1964*). Cover the pads with watch glass and keep it exposed in sunlight for four hours. Remove the pads, wash with water and allow to dry off. Examine visually any colour change in spotted zones.

E-1.2 The material shall be deemed to have passed the test if the film does not show any colour change in spotted zones.

*Specification for laundry soap (revised).

APPENDIX F

[Table 1, Sl No. (xvi)]

TAPE TEST

F-0. GENERAL

F-0.1 Outline of Method — A tape is applied to the painted panel and stoved at 130°C for 30 minutes. Afterwards the tape is removed and the film is examined for staining and permanent print.

F-1. PROCEDURE

F-1.1 Apply a 2.5 cm strip of masking tape over the length of the painted surface half an hour after the normal bake is performed. The taped panel shall then be baked for 30 minutes at a temperature of 130°C. Upon cooling, the tape shall be removed and the panel inspected for staining and permanent printing.

F-1.2 The material shall be deemed to have passed the test if no stain and permanent print is left on the film after the tape is removed.

APPENDIX G

[Table 1, Sl No. (xvii)]

TEST FOR IMPACT RESISTANCE

G-0. GENERAL

G-0.1 Outline of Method — The painted panel is subjected to impact test in a Gardner Variable Impact Tester and film examined for deterioration.

G-1. PROCEDURE

G-1.1 All test panels, prepared as described in **B-2.2**, shall be subjected to an impact of 0.92 kgf.m directed on to the painted side (impact-in) using a Gardner Variable Impact Tester.

G-1.2 Utilizing the same panels, age in an oven at a temperature of 60°C for 10 days and repeat the impact test. The panel shall not show any signs of deterioration of the paint film.

APPENDIX H

[Table 1, Sl No. (xviii)]

TEST FOR INTERCOAT ADHESION

H-0. GENERAL

H-0.1 Outline of Method — Two diagonally intersecting lines were cut through the painted panel and a tape is applied to cover the cuts. These tapes are pulled sharply and any lifting of the top coat is examined.

H-1. PROCEDURE

H-1.1 Prepare panel as prescribed in **B-2.2**. Cool the stoved panels for 30 minutes. Cut through the metal two lines, diagonally intersecting, at least 20 cm in length. Apply masking tape, of 2.5 cm width to cover the cut through lines completely. Pull the tapes sharply upwards and check for any lifting of the top coat from the primer.

H-1.2 The material shall be deemed to have passed the test if tape could be pulled off sharply.

APPENDIX J

(Clause 3.5)

TEST FOR RETOUCHABILITY WITH CELLULOSE NITRATE LACQUERS

J-0. GENERAL

J-0.1 Outline of Method — The panels prepared as prescribed in **B-2.2** are coated with nitrocellulose surfacer and cellulose nitrate lacquer and film examined for compatibility.

J-1. PROCEDURE

J-1.1 Prepare the painted panels as described in **B-2.2**. Slightly wet with emery paper No. 400 to give a smooth surface. Wash thoroughly with water and dry for 30 minutes. Then, apply a coat of surfacer, nitro-cellulose (conforming to IS : 6126 - 1971*), dry for 30 minutes and apply a coat of lacquer, cellulose, pigmented, glossy (conforming to IS : 5691 - 1970†). Dry for 15 to 30 minutes and examine the film.

J-1.2 The film when examined should be smooth, with a glossy finish, free from sagging and wringing and also firmly adhered to the enamel film.

*Specification for nitrocellulose surfacer.

†Specification for lacquer, cellulose, pigmented, glossy.